



# From climates multiple to climate singular: Maintaining policy-relevance in the IPCC synthesis report

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## ABSTRACT

The Intergovernmental Panel on Climate Change (IPCC) has provided periodic assessments of the state of knowledge on climate change for 30 years. While these assessments have been central to the making of international climate policy, their relevance has been questioned in the post-Paris era. Can the IPCC's global kinds of knowledge match the demands of an increasingly decentralized and polycentric policy landscape? In this paper we respond to this question by analysing how the IPCC renders a multiple object such as climate change amenable to political intervention. We are particularly interested in the socio-material practices undertaken to translate a complex body of knowledge into a synthesis relevant to climate policy-making. To that end we trace the production of the Synthesis Report (SYR) to the IPCC's 5<sup>th</sup> Assessment Report (AR5), from scoping, to chapter crafting and final plenary approval, using author interviews, document analysis and observations. We argue that the writing of an IPCC synthesis is a constitutive process that rests upon numerous practices of standardization, aggregation and simplification. While these practices allow the authors to produce a coherent story of global climate change, they are less attuned to demands for geographically-sensitive representations of climate impacts, vulnerabilities and a diversity of response options. As the ways of responding to a changing climate multiply, we argue, so should the understanding and making of policy-relevant knowledge.

## 1. Introduction

Following the mandate in the UN General Assembly Resolution 43/53 of 6 December 1988 (UNGA, 1988), the Intergovernmental Panel on Climate Change (IPCC) was designed to serve global policy with scientific information on the nature, impacts and policy implications of climate change. The panel has, in interplay with the UN Framework Convention on Climate Change (UNFCCC), produced five IPCC Assessment Reports and numerous Special Reports. Although the IPCC is autonomous from the UNFCCC, these two organizations have, in the words of Sarewitz (2011, p. 475), become “inseparable siblings” that “have grown up together and acted in concert”.

This interplay between the science and politics of climate change has turned into a rich site of scholarly investigation. In science and technology studies climate change represents the prime example of how global knowledge-making is co-constitutive of global decision-making (Beck et al., 2017). Through the work of the IPCC the international community has learned to relate to a new global kind – the global climate system – and agreed that threats to this system demand worldwide cooperation and the creation of new international institutions (Miller,

2004, p. 339). In the years following the 2009 UN climate conference in Copenhagen, the forms of knowledge that had thus far informed international climate policy were questioned, not least by those closely involved in the IPCC assessment process (Bagley, 2013; Nature, 2010; Stocker, 2013). The techniques employed by the IPCC to establish climate change as a collective action problem had, according to critics, turned climate change into a story of global mean temperature and thus foreclosed the range of possible response options (Beck and Mahony, 2017; Hulme, 2010; Machin, 2013). By translating the multi-layered problem-complex of climate change (climates multiple) into a unitary global problem (climate singular), the IPCC paved the way for a single policy agenda: emissions control monitored through a UN coordinated policy regime (Sarewitz 2011, p. 479).

Through the adoption of the 2015 Paris Agreement, the monocentric climate regime developed around the Kyoto Protocol is today replaced by a more decentralized, dispersed and polycentric climate governance order (Jordan et al., 2018). By inviting states to propose nationally-appropriate mitigation and adaptation responses, the Paris Agreement has distributed responsibility for climate action across multiple actors, arenas and sites. While this ‘bottom-up’ polycentric

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world of climate governance has been subject to scholarly analysis (Bäckstrand et al., 2017; Jordan et al., 2018), less has been said about the implications for climate science and the policy advice offered by international expert bodies such as the IPCC. Debates about the suitability of the IPCC's assessment practices and procedures have been revived (e.g. Devès et al., 2017; Edenhofer and Minx, 2014; Hulme, 2016). Thus we ask, how well-suited are the assessment procedures of the IPCC for the climate policy landscape unfolding after Paris?

In this paper we address this question by offering a close empirical account of the IPCC's Fifth Assessment Report (IPCC AR5 SYR) published in November 2014. The SYR is an important document that, for many governments, represents available scientific information on climate change. Which knowledge enters into the report is thus of highest political importance and subject to careful negotiation by the involved IPCC authors, government experts and third-party reviewers. In this paper we ask how this selection process is undertaken in the making of an IPCC SYR and discuss the implications for how climate change is made knowable and governable as a political problem. The analysis rests upon three sources: IPCC documentation; nine semi-structured interviews with IPCC authors involved in the Core Writing Team (CWT); and participant observations at the 40th IPCC Plenary Approval Session of the SYR in 2014.

Our findings forefront a tension between the IPCC's efforts to offer a coherent global story of climate change and political calls for more decentred and geographically-sensitive representations of climate impacts, vulnerabilities and response options. While we argue that this tension stems from the IPCC's mandate to serve global climate policy, we also suggest that it calls for reflection and debate. In the increasingly polycentric Paris climate regime, it is no longer clear that globalized explanations and predictions of climate change offer the most compelling form of science advice, something that is recognized in the contestations present in the writing of the IPCC SYR. As the ways of responding to a changing climate multiply, so should the understanding and making of policy-relevant knowledge.

## 2. Making climate change global

Global ways of seeing environmental problems were born along with modern environmentalism in the 1970s and have since then offered a cognitive frame for environmental action (Heise, 2008; Höhler, 2008; Jasanoff and Martello, 2004). Climate change is the global environmental problem *par excellence*. Scholars have detailed how global climate signatures such as global mean temperature and atmospheric carbon concentrations gained ascendancy in the 1970s and 80s, hereby lending visibility to climate change as a global object to be understood, investigated and governed on planetary scales (Edwards, 2010; Hulme, 2010; Miller and Edwards, 2001).

The periodic assessments of climate science produced by the IPCC since the early 1990s have been central to the construction of a global ontology of climate change. While the body of knowledge underpinning the IPCC assessments is complex, diverse and increasingly sensitive to the multiple political geographies of climate, the synthesizing mandate of the IPCC has often resulted in a recalibration of more local scales of meaning into distant imageries of climate change (Jasanoff, 2010). There is a substantial literature examining the authorship of the IPCC assessment reports (Ford et al., 2016, 2011; Ho-Lem et al., 2011; Hughes, 2012; Yamineva, 2017) as well as the role and inclusion of disciplinary expertise (Björström and Polk, 2011; Hiramatsu et al., 2008; Victor, 2015). The unbalanced geographical and disciplinary representation amongst the IPCC's author groups, and 'harmonization' of voices through particular epistemic approaches to authorship has been another focus of interest (Corbera et al., 2016; Hughes and Paterson, 2017). These approaches have been used to explain why people, both scientists and policy-makers, from the developing world or from particular disciplinary backgrounds, find themselves "disenfranchised from the scientific discourse on climate change" (Runci,

2007, p. 226). The political mandate and assessment procedures of the IPCC are also well-researched and offer a historical backdrop to the organizations' intergovernmental character and struggle to remain relevant to global climate policy (Agrawala, 1998b, 1998a; Bolin, 2008; Hecht and Tirpak, 1995; Skodvin, 2000). Taken together, the place the IPCC occupies organizationally and epistemologically both shape the IPCC's global construction of climate change (Hughes, 2015, p. 95, see also Edenhofer and Kowarsch, 2015).

To translate the peculiarities of place and context into a global climate signature is an achievement that requires extraordinary efforts of the imagination (Hulme, 2010). It also a dedicated material practice that involves multiple techniques of knowledge translation. Our analysis of this translation process is therefore informed by anthropological studies of science. Through their seminal study of laboratory life, Latour and Woolgar (1986) entreated us to bring scientific findings back into connection with the practical contexts in which they are produced through selection, aggregation, and simplification. Since then a growing literature has taken an ethnographic interest in knowledge making as a material practice that intervenes in the world of things (Barry, 2013; Mol, 2002; Whatmore, 2002), before they are 'black boxed' as facts (Latour, 1987). Rather than asking epistemological questions about science's ability to represent physical reality, work in this field foregrounds the ways by which objects of the world are assembled, performed and enacted through the work of science (Mol, 2002; Mol and Law, 2002). From this perspective the IPCC SYR report can be seen as a device of translation, a document with performative capacities to shape politics in bringing global and singular climate change into being (see Weisser, 2014).

In order to access the practical ways in which an IPCC synthesis engages with climate change, this paper traces the several-year assessment process through a close reading of SYR meeting reports, SYR drafts, comments offered by external reviewers, nine semi-structured interviews with members of the SYR Core Writing Team (CWT), as well as observations made at the SYR Approval Plenary in Copenhagen in 2014. Our analysis is centred around two moments of contestation when debates over what counts as policy-relevant knowledge raised questions about how climate change is imagined and known as a political problem: 1) the Box on Article 2 of the UNFCCC, and 2) the global Map of Impacts of Climate Change (SPM Figure 1.3). Whilst others have used similar methodological approaches to investigate the IPCC (see also Hughes, 2012, 2013), in this paper we contribute to the expanding literature by critically examining the links between the IPCC's mandate to be policy-relevant and the knowledge-making practices of writing the SYR. In turn, rather than taking 'global climate change' as a natural starting point for our analysis, we trace how the global figure is accomplished, but also challenged, by the authors and government experts involved in the making of the IPCC AR5 SYR.

## 3. The IPCC synthesis report (SYR): writing a coherent policy-relevant story

The decision to undertake the IPCC's Fifth Assessment Report, including the SYR, was made at the IPCC's 28<sup>th</sup> Session in April 2008 when expectations of a new global climate treaty were mounting. The subsequent scoping and drafting of the report, however, unfolded in view of the diplomatic failure at the UN Climate Conference in Copenhagen and the 'Climategate' controversy that erupted in November 2009 when compromising emails by leading IPCC scientists leaked to the blogosphere.

The writing of the SYR AR5 was organized around five meetings of the Core Writing Team (CWT) between June 2012 and November 2014. The earlier meetings of the team involved planning and working through the SYR outline approved by the IPCC Plenary in 2010. The later meetings were devoted to successive drafts of the SYR and the comments received from reviewers (see Fig. 1 for an overview of these sessions). Since the SYR is developed in parallel with the WG reports,

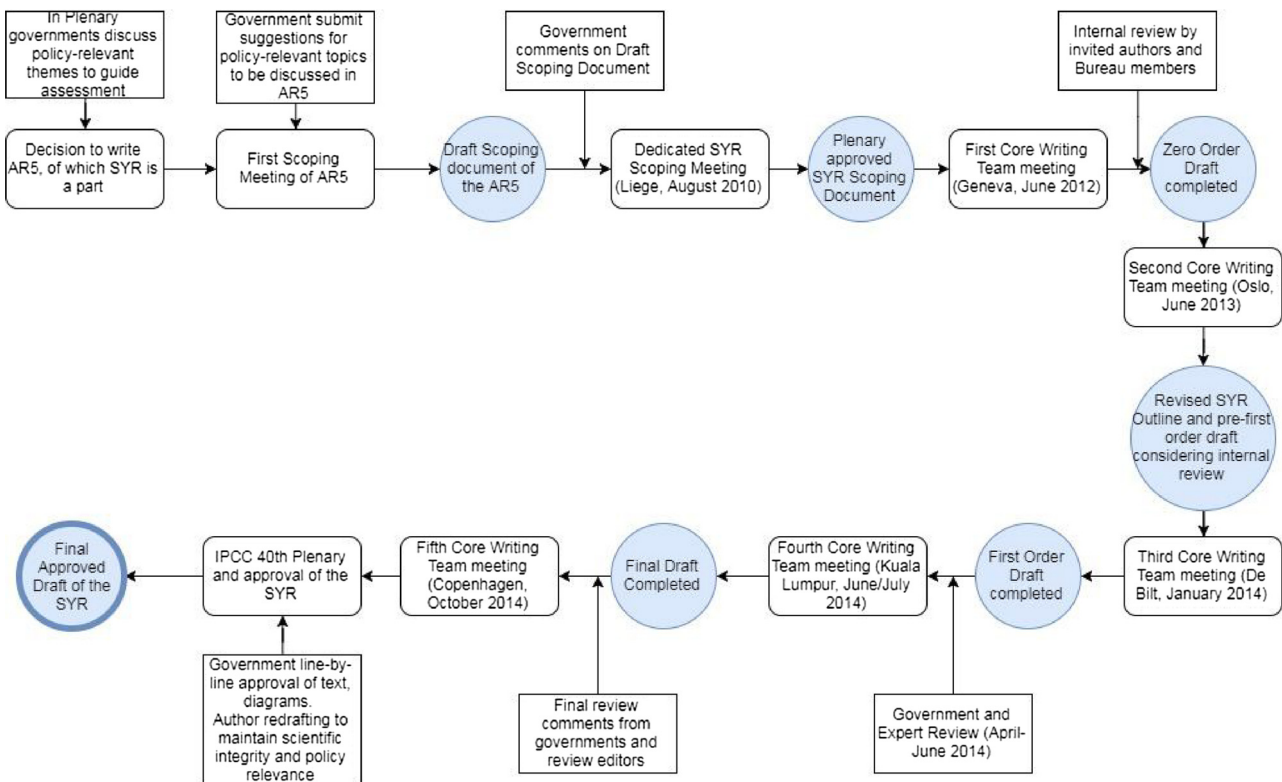


Fig. 1. Process of writing the IPCC AR5 SPM (Authors' own).

the members of the CWT initially brought their disciplinary affiliations and WG perspectives to the writing process (int.4). This disciplinary alignment was partly a result of the early drafting of the SPM relying on the Summary for Policy Makers (SPMs) and Technical Summaries (TS) from each of the WGs to shape the outline (int.3, 4, 5, 8). However, as the CWT meetings and review rounds progressed, the aim to offer an integrated synthesis took hold and individual scientists who had been doubtful about the knowledge integration required for the SPM discovered shared interests (int.1), for instance connections between greenhouse gas concentrations and the impacts of climate change (int.3), or between extreme events and vulnerability (int.4). The “un-anticipated team-building” (Leemans, 2008, p. 16) made possible by the CWT meetings, allowed several of the authors to free themselves from disciplinary rules, concepts and jargon (int.3, 5, 6, 8; see also Fløttum et al., 2016), for instance the specific ways in which the term ‘attribution’ is used in WGI and WGII (int.5). The shaping of a ‘nice story’ (int.3) became a collective goal for the CWT and an important way to bring climate change to wider audiences (int.4).

Two main criteria guided the selection of material for the SPM; 1) knowledge of relevance to the policy community; and 2) scientific robustness of findings. Since engagement with the policy community is an important part of the IPCC assessment process (Leemans, 2008, also see Fig. 1), governments were consulted in the early scoping of the SPM about which policy-relevant topics to include (IPCC, 2009a). In these consultations, topics such as uncertainty of climate predictions, adaptation, sustainable development and low emission scenarios were brought to the fore (ibid.). Many countries, both developed and developing, emphasised the importance of assessing regional and local impacts of climate change, relevant to their particular economies. To inform regional climate adaptation strategies, the IPCC was asked to highlight short and long-term climate impacts on regional water resources, forest and mountain areas, ice cover and oceans.

In parallel to this government review, scientific experts reviewed drafts of the SPM, thereby ensuring the robustness of the findings (int.3, 8). Through the review rounds, scientific experts added information

that sometimes complicated the coherent story of climate change crafted by the CWT (int. 8). While the CWT aimed to bring “major findings” to the fore, expert reviewers often pushed for the inclusion of so-called “minor findings” from the WG reports (int.8). When one reviewer wanted a bullet point on air quality from WGI to be included in the SPM, for instance, the CWT insisted that it did not belong to the major scientific findings of relevance for the report owing to its lack of robust underpinning in the scientific literature (int.8). However, when ocean acidification was left out of an early draft of the report, the CWT was challenged by an entire community of researchers and reinserted it (ibid.). Thus, the strength of the scientific community, and the body of science available as a result, played a large part in the distinction of major and minor findings. Whilst this was used to secure the scientific robustness of the report (int.3, 5, 8), it also became an important selection device enabling the CWT to develop a coherent and policy-relevant story of global climate change.

The writing of a SPM, therefore, is shaped by more than the official assessment processes of the IPCC. It is moulded by the involved actors’ interpretations of what constitutes major scientific findings, the desire for policy-relevance and the goal to create a common narrative. The plenaries and scoping meetings, as well as CWT meetings and review rounds, resulted in the crafting of a document which cuts the extremes, in terms of emerging findings and geographically-specific knowledge on climate impacts, socio-economic vulnerabilities and policy responses (int.4) (see also Brysse et al., 2013). This is selection is acknowledged by the CWT, as they recognized that what is considered a “minor finding” in terms of scientific robustness may in fact be those which are more attractive politically (int.3, 4). Overall, what emerges is therefore by default an aggregated global figure – a climate singular.

The coherent policy story told by the CWT was, however, not uncontested. During the writing process numerous efforts were made to complicate and multiply the global ontology of climate change. In the following we turn to two moments of contestation when debates over what counts as policy-relevant knowledge raised questions about how climate change is imagined and known as a political problem in the

## AR5 SYR.

3.1. *Boxing dangerous climate change*

In the comments submitted prior to the Liege Scoping meeting in 2010 (IPCC, 2010b), many governments called for a synthesis of scientific information on Article 2 of the UNFCCC. Article 2 specifies the objective of interstate negotiations on climate change and has, since the Rio Conference in 1992, been subject to multiple interpretations. While the article states that the UNFCCC should strive to stabilise “greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (UNFCCC, 1992, p. 4), governments have long disagreed upon a quantitative measure for *dangerous* levels of greenhouse gases (GHG) in the atmosphere. The IPCC has aimed to stay neutral in these political discussions. However, over the years it has repeatedly been drawn into the operationalization of Article 2, and the history of the IPCC SYR is deeply tied up with this process (see also IPCC, 2009b).

By the time the AR5 was underway, IPCC discussions on Article 2 were well developed. An expert meeting was held in 2004 to consider how to incorporate the issue in the 4<sup>th</sup> Assessment Report (AR4) (IPCC, 2010c), but no advancement on how to address this topic had been made beyond its inclusion as a Cross-cutting theme (CCT) in the SYR (IPCC, 2009a, 2010c). When commenting on the scoping document of the AR5 SYR, many countries asked the IPCC to link its analysis of Article 2 to the 1.5 and 2 degrees C targets which were on the political agenda after Copenhagen (IPCC, 2010c). Despite most SYR authors agreeing that what constitutes dangerous climate change was one of the most policy-relevant and central questions for climate science (int.5), they struggled to select relevant scientific findings on Article 2 to include in the report. Not least because at this point there were few scientific papers which directly discussed the question of 1.5 as a temperature stabilization target. In August 2010, the IPCC held a consultation to discuss how to integrate Article 2 analyses across the three WGs of AR5 on the request of governments (IPCC, 2010a, also int.4, 7). It was at this point that a standalone 5<sup>th</sup> topic on Article 2 was suggested by Thomas Stocker (Co-Chair of WGI) as a ‘synthesizing theme in the SYR’ (IPCC, 2010a, p. 3). The rapporteur for the break-out group on transformations was tasked with developing the outline for a 5<sup>th</sup> topic on *Science supporting Article 2 of the UNFCCC* (IPCC, 2010d). Proposing a standalone topic on Article 2 which extracted it and decoupled it from its basis (int.4) gave it central importance within the SYR.

The outline included bullet points on risks and vulnerabilities, level and timing of stabilisation of GHGs, impacts on ecosystems, food production, sustainable economic development and regional information relating to Article 2 (IPCC, 2010d). Debates on this topic continued at the 32<sup>nd</sup> IPCC Plenary, which took place shortly after. For some countries, having Article 2 as a central synthesizing theme in SYR AR5 was considered ‘too policy-relevant’ (int.6), or too closely linked to the political negotiations that were unfolding after the Copenhagen conference and thus risked becoming policy prescriptive. It was at this point that the compromise option of a Box on Article 2 of the UNFCCC was proposed (IPCC, 2011: Annex 4). The *Box on Information Relevant to Article 2 of the UNFCCC* was returned to at the successive meetings of the Core Writing Team, with the aim of producing a double-page spread. However, as governments, authors and expert reviewers contributed suggestions as to what should be included, the Box expanded in scope, at one point reaching 10 pages including figures (int.6). The difficulty of synthesizing 4000 pages of science into one Box generated a heated debate on how to best present dangerous climate change in a scientifically robust way (int. 5). As one SYR author asked, is it really necessary to create “a summary of a successive series of summaries” in order to present the relevance of the IPCC’s findings (int.4, 5, 7, 8)?

Some authors, primarily those involved in WGII and backed up by the IPCC Chair, suggested that the Box should contain information on

regional aspects of dangerous climate change that are explicit in Article 2, such as food security, water availability and economic development (see IPCC, 2010a). The discussions brought the disciplinary affiliations of CWT members back into the picture, and all WG representatives wanted to see their parts in the final version of the Box (int.6). The authors’ efforts to accommodate multiple aspects of climate change resulted in an overly complicated Box that failed its synthesizing purpose. In the First Order Draft of the SYR, the Box therefore maintained a focus on *global* GHG concentrations pathways and *global* average temperature increases with little reference to particular regions or ecosystems (IPCC, 2014a). Policy-relevance was more easily expressed through already-accepted global climate signatures and aggregated measures of climate impacts, such as a variation of the ‘burning embers’ diagram (int.3, see Final Draft SYR) – an IPCC diagram, first included in the AR3 in 2001, which groups the risks of climate change into five “reasons for concern” which increase with global mean temperature rise<sup>1</sup> – rather than through differentiation and multiplication of regional climate impacts and vulnerabilities.

In October 2014, the IPCC gathered for the 40<sup>th</sup> Plenary and the approval of the SYR. At this meeting, debates over the Article 2 Box continued, and a Contact Group was given the mandate to reduce the text and agree on what information to include. In part this concerned the language used in the Box. To avoid political contestation, it was decided that already-approved text from within the WG reports should be used (int.4, 7). However, by the last day of the IPCC Plenary authors and government delegates still did not agree on which information to include in the Box and how it should be best presented (author observations, and int.6, 7, 8). Efforts to link global emission scenarios to regional and local impacts on food security and ecosystems proved too difficult and politically contested. In the end the plenary decided to cut the Box from the final draft of the SYR and replace it with the sentence; “Through the entire length of the SYR, information is also provided relevant to Article 2, the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC)” (IPCC, 2014c, p. viiIPCC, 2014dIPCC, 2014c, p. vii).

3.2. *Mapping the impacts of climate change*

Figures and diagrams are important synthesizing objects in IPCC reports (int.2, 4, 6, 8, IPCC, 2010d) and are designed to make the many intangible aspects of climate change legible (Mahony, 2015; McMahon et al., 2016). Previous scholarship has shown how the design choices of IPCC visuals impact how climate change is understood and acted upon by policy-makers and the general public (McMahon et al., 2016). The coordination of the graphs in the SYR involved hundreds of emails among the CWT members, and generated discussions on everything from lines to scales, colours and location of symbols (int. 8). Through this thorough scientific scrutiny, the CWT hoped to avoid political debates on the underlying science of graphical representations included in the SYR AR5 (int. 1, 2, 8). However, to remove traces of the human hand and produce impersonal, apolitical and universal imageries of global climate change (Jasanoff, 2010) proved challenging.

Fig. 4 of the SPM in the SYR can illustrate the potential politics lurking in IPCC visuals (see also Tschakert, 2015 on similar discussions during the Structured Expert Dialogue of the 2013–2015 Review of the LTGG). This figure, depicting a world map with the projected impacts of climate change marked as representative symbols (see Fig. 2 below), is an attempt to bring a multiplicity of scientific findings, from different disciplines and regions, into a single graphical illustration. In AR5 the

<sup>1</sup> The ‘burning embers’ diagram has become a site of controversy primarily criticised for lacking objectivity and highlighting value judgements associated with ‘dangerous climate change’ at a global, aggregate level which potentially contributed to the existence of a global threshold of 2 degrees (see Mahony, 2015).



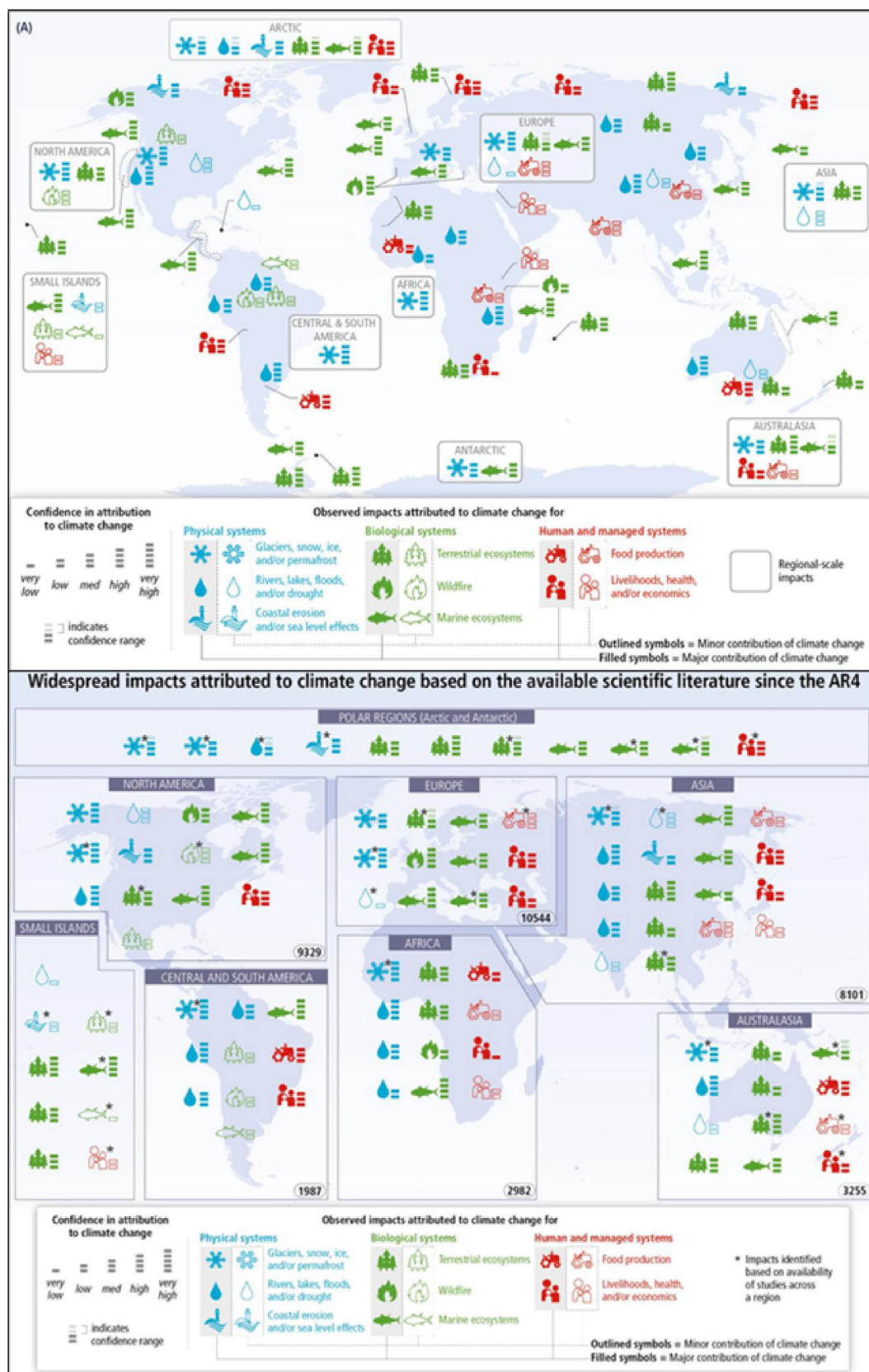


Fig. 2. Map of Impacts from IPCC AR5 SYR: top panel – Final Draft prior to Plenary (approved WGII figure) (IPCC, 2014e), bottom panel – Final Figure after Plenary (IPCC, 2014c).

map first appeared in Chapter 18 of WGII alongside a set of tables (Tables 18.5–18.9). The map brought together the literature on observed impacts of climate change on mountains, snow and ice, rivers, lakes and soil moisture, terrestrial ecosystems, coastal and marine ecosystems, and human and managed systems. It illustrates climate impacts by region, as well as the confidence in detection and attribution. The map (left panel below) was included in the WGII SPM final draft and attracted attention during the government review. Many countries requested clarity on how key risks were selected and suggested additional information to be included in the final map (int.2). In response to these requests, the WGII author team included a supplementary table explaining the various symbols in more detail. At the Plenary of WGII in Yokohama in March 2014, the figure “sailed through approval” (int.2).

The map was included in the First Order and Final Drafts of the SYR with the caption ‘global patterns of observed climate change impacts...’ (IPCC, 2014a, 2014b), and underwent marginal changes in response to the government review rounds (IPCC, 2014d). When the map was addressed at the IPCC Plenary in Copenhagen 2014, however, it became subject to a great deal of political debate, revealing tensions between what is deemed policy-relevant and the ability to present an objective and robust scientific picture of the impacts of climate change across different world regions. Several developing countries, and small islands, expressed concern that the map’s global outlook misrepresented the diversity and severity of regional climate effects and vulnerabilities (author observations over Plenary). This concern manifested itself through discussions over the location of symbols on the map. African country delegates, for instance, suggested that the ice, snow and glacier symbols over the African continent strongly simplified the climate impacts experienced by African states as the main part of the continent had heat, drought and floods as their principal problem and hereby downplayed the challenges of climate adaptation at the regional scale, particularly with regard to agriculture. Caribbean delegates were uncomfortable about the perceived lack of any impacts attributed to climate change over the Caribbean islands, whilst they felt strongly that they were experiencing stresses such as increased extreme weather event and flooding that, in anecdotal terms, were attributable to climate change (ibid). Hence, for policy-makers in the global South, the IPCC diagram failed to represent climate realities on the ground (author observations, int.1, 2, 5), and pointed to the lack of climate impact and vulnerability studies in the African and small island regions.

Two aspects of the controversy over the Map of Impacts highlight the politics involved in reducing the multiple impacts and vulnerabilities of climate change to a singular global figure. Firstly, to the authors involved in the SYR’s CWT, the ability to offer an aggregated illustration of the geographical patterns and variations of ongoing climate change was the main strength of the figure. Without a graphical representation of the global distribution of climate impacts, several of the authors felt that it was harder to claim that these impacts are widespread (int.1, 2). However, in the process of compiling the information for the map, the authors had to select which climate impacts were the most important, robust, and policy-relevant for the respective regions. For some regions, typically in the developing world, the lack of available scientific data limited the selection. For well-studied areas such as Europe and the United States, by contrast, only some of the known impacts appeared on the map. The policy-relevant scientific message of the map was deemed to be simply that impacts are being felt collectively throughout the globe. However, this message did not resonate well with those government delegates who were more concerned with the policy-relevance to their constituents (see also Karlsson et al., 2007). The second point therefore, is that the methods of aggregation and simplification that the CWT engaged in when putting together this figure, privileged the existence of ‘impacts’ which had been proved in scientific studies. Although this is of course not surprising given the IPCC’s mandate and sources, it does perhaps illustrate a limitation connected to the ability of traditional scientific discourse and methods

to properly present the complexities of climate change to people in local settings (Ford et al., 2016; Runci, 2007).

To resolve the problems with the Map of Impacts, the Copenhagen plenary convened authors and government delegates in a Contact Group. The version which was eventually presented and approved in plenary (see Fig. 2, right panel) included several changes. The regional impact boxes with specific locations of particular climate impacts, were replaced with one box which included all the impacts for a continent or region, accompanied with a number which represented the existing studies on climate change impacts available for that region, to draw attention to the disparities. Therefore, although the map was unable to present down-scaled information of relevance for policy-makers and in doing this it reverted to a more aggregated form, it also presented a new collective message: that more scientific studies on climate impacts are needed, particularly in the global South.

#### 4. Climate singular or climates multiple? Rethinking policy-relevant knowledge

As noted by Sheila Jasanoff (2010, p. 234) abstraction is the method by which modern science achieves its universality and heft. The capacity to wrench phenomena out of their specific contexts and create entities that reflect no one’s unmediated observations of the world and yet are recognized and accepted as real, is the foundation of science’s special cognitive authority (ibid). In the IPCC’s case this abstraction takes place through the socio-material practices that result in particular framings, approaches, devices, and types of knowledge coming forward at the expense of others and converging around an integrated, global story of climate change. The Synthesis Report plays a particular role in this process. This paper has shown how through the processes of scoping, drafting, review and plenary negotiation, the authors in the CWT were encouraged to think beyond their disciplinary perspectives and vocabularies to engage in selection, aggregation, and simplification thus contributing to the overall abstraction of climate change.

By focusing on “major findings” and plotting these into global maps and comprehensive boxes, the SYR was detached from the embedded meanings and lived experiences of a changing climate documented across the world (for a similar discussion with respect to the AR4 see Lahn and Sundqvist, 2017), as well as marginalizing potential emerging scientific findings which are not yet supported by a large coordinated scientific infrastructure, yet might be seen as particularly relevant for policy makers in certain parts of the world. The inclusion of bullet points on ocean acidification, and exclusion of air quality in an early draft of the SYR as eluded to in Section 3 is a case in point. Whilst there was no direct trade-off between the selection of ocean acidification and that of air quality, the lack of a large network of scientists who together called for the insertion of air quality suggest that the existence of hegemonic scientific communities which fit with the IPCC’s view of what is counted as robust science (Corbera et al., 2016) are key in gaining visibility for emerging scientific findings. Similar debates were addressed by authors when considering the climate change impact community, and their lack of coordination which made putting together the Map of Impacts so challenging in the first place. In these cases the blame is often put on the knowledge-making practices of these scientific communities which do not lend themselves to being incorporated into objective, robust, and policy neutral reports that the IPCC aims to produce (see also Minx et al., 2017).

The controversies over the Article 2 Box and the Map of Impacts illustrated many of these points. Throughout the SYR AR5 review process and plenary negotiations, we saw reoccurring calls for more geographically-sensitive information on the dangers and impacts of climate change. The coherent global story of climate change projected by the SYR was repeatedly criticized for not reflecting the diverse forms of knowledge present in the three WG reports, and for failing to meet the needs of policy-makers seeking to respond to the local realities of a changing climate. Abstraction took place in this case by privileging

scientific representation over the experiences of the government representatives present in the room. This is indeed a part of a larger debate about the types of material that should be included in assessments (e.g. Ford et al., 2016; Viner and Howarth, 2014), and what should be excluded, and on what basis. The aggregation of climate impacts into map legends and the request to include already approved language in a draft of the Article 2 Box illustrate how attempts to bring forward the multiple realities of climate change were challenged by the IPCC's mandate to remain policy neutral, and by the processes of approval and consensus (see also Devès et al., 2017). While moments of contestation like the Box on Article 2 and the Map of Impacts highlighted the inadequacy of global mean figures and visuals, they paradoxically resulted in a regress to the same global scales of meaning. When negotiating a synthesis that all involved actors can accept, the decontextualized and impersonal imaginary of global climate change was closest at hand.

By highlighting these aspects, we are not suggesting that the scientific basis of climate change is not important. The global climate has indeed gained immense political value during the past three decades, and by translating a multi-layered and complex phenomenon into a unitary global problem, the IPCC has successfully paved the way for a global politics of climate and made possible institutional arrangements such as the UNFCCC, the Kyoto Protocol and the Paris Agreement. It is not surprising, therefore, that the global climate has become tied up with IPCC visions of policy-relevance. Despite this, this paper has shown that climate change is not just written in the words of the IPCC reports, but it is also performed in the writing, selection, and negotiation that make up the final SYR. Thus, it is important that what is written about it should make evident the culturally and socially specific complexities that climate change implies. Recognizing that this process does matter, and shedding some light on how it is done, provides the first step towards change in the Post Paris political landscape.

The Paris Agreement marked a turning point for global climate governance towards a more hybrid and polycentric policy landscape (Dorsch and Flachslund, 2017). As state and non-state actors across the North and South are now developing nationally determined policy responses to climate change, the very meaning of policy-relevant science is changing. Contemporary policy debates are less about proving the existence and measurability of anthropogenic climate change than finding ways of preparing for and responding to climate change in its many regional variations. Until now the IPCC has successfully fulfilled its purpose to synthesize the body of knowledge available on climate change and hereby serve global climate policy. To respond to the needs of a polycentric policy landscape is a different task that requires a more detailed engagement with the multiple realities of climate change as they unfold across the world. The current assessment and synthesis practices of the IPCC seem poorly attuned to that task, and therefore we argue that the time has come to move beyond global mean indexes and stabilization pathways and to develop science advice that is ready to respond to climate change in its complexities.

## Declarations of interest

None.

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## List of Interviews

- Int.1: Member of Core Writing Team – Skype Interview – 13<sup>th</sup> January 2016.  
 Int.2: Member of Core Writing Team – Skype Interview – 13<sup>th</sup> January 2016.  
 Int.3: Member of Core Writing Team – Skype Interview – 9<sup>th</sup> May 2016.  
 Int.4: Member of Core Writing Team – Skype Interview – 3<sup>rd</sup> May 2016.  
 Int.5: Member of Core Writing Team – Skype Interview – 6<sup>th</sup> September 2016.  
 Int.6: Member of Synthesis Report Technical Support Unit – Paris – 3<sup>rd</sup> December 2015.  
 Int.7: Member of Core Writing Team – Skype Interview – 10<sup>th</sup> May 2016.  
 Int.8: Member of Core Writing Team – Skype Interview – 28<sup>th</sup> April 2016.